Tierra's Responses to EPA's 15 February 2017 Comments on
Newark Bay Study Area Feasibility Study Work Plan (Tierra Solutions, Inc., December 2016)
March 31, 2017

1) General Comment:

The Draft Feasibility Study (FS) Work Plan prepared by Tierra Solutions, Inc. (Tierra) and dated December 2016 includes multiple references to the risk assessment process and also identifies the preparation of a Probabilistic Risk Assessment (PRA) as part of the Newark Bay Study Area (NBSA) Remedial Investigation (RI).

Completion of the deterministic risk assessment is necessary to inform the need for a PRA and should serve as the basis for any decisions regarding whether a PRA needs to be conducted during the RI. Before conducting a PRA, a PRA Work Plan must be submitted to EPA for review and approval. A PRA Task is not included in the Tierra project schedule dated January 2017, and further discussion is required with EPA regarding integration of a PRA deliverable with the NBSA RI/FS process.

Reference to the specific types of risk assessments to be conducted should be removed from the FS Work Plan. FS Work Plan text regarding the risk assessments could be addressed via a broad statement, to be added to Section 4.1, that the FS will rely on the findings of the Newark Bay risk assessments to establish Remedial Action Objectives (RAOs) that are protective of human health and the environment, with consideration of detected contaminant levels, exposure pathways, protective risk ranges, preliminary remedial goals, and ARARs. Please revise the text in Section 1.4.2, Section 3.0, Section 4.1, and other sections (as appropriate) to remove reference to the PRA.

Tierra Response
Responses to the PRA-related comments were discussed during a conference call between Tierra and USEPA on March 16, 2017; a decision from USEPA is pending. The RTCs will be amended once Tierra receives direction from USEPA.

2) Section 1.1 "Regulatory Setting"

Please also reference the following sediment remediation and FS guidance documents in Section 1.1 and consult them for development of the FS:

- *Contaminated Sediment Remediation: Remedy Selection for Contaminated Sediments* [Interstate Technology and Regulatory Council (ITRC), August 2014]
- *Climate Change Adaptation Technical Fact Sheet: Contaminated Sediment Remedies* (EPA 542-F-15-009, April 2015)
- *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites* (EPA 540-R-09-001, December 2012).
- *The Feasibility Study: Detailed Analysis of Remedial Action Alternatives (EPA OSWER Directive 9355.3-01FS4, March 1990).*

Tierra Response
The following text will be added to Section 1.1 of the FS Work Plan:

The following documents will also be consulted during development of the Feasibility Study:

- *Contaminated Sediment Remediation: Remedy Selection for Contaminated Sediments* [Interstate Technology and Regulatory Council (ITRC), August 2014]

- *Climate Change Adaptation Technical Fact Sheet: Contaminated Sediment Remedies* (EPA 542-F-15-009, April 2015)
- *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites* (EPA 540-R-09-001, December 2012)
- *The Feasibility Study: Detailed Analysis of Remedial Action Alternatives* (EPA OSWER Directive 9355.3-01FS4, March 1990).

3) Section 1.1 "Regulatory Setting"

Please check the web link in the PDF document; while the URL text displays correctly, the link does not seem to connect to the "Superfund Contaminated Sediments: Guidance Documents, Fact Sheets and Policies" webpage.

Tierra Response
The FS Work Plan link will be removed and the sentence will be revised as follows:

"Additional documents available at the USEPA internet site, "Superfund Contaminated Sediments: Guidance Documents, Fact Sheets and Policies," may be incorporated in the FS."

4) Section 1.2 "Feasibility Study Process"

Please add underlined text as follows to modify the second sentence to read "The data collected in the RI, including the findings of the baseline risk assessments, influences the development of remedial alternatives…"

Tierra Response
The second sentence will be modified as directed by including the underlined text.

5) Section 1.3 "Document Organization"

Please revise the text to indicate that the final, agency-approved version of the *Lower Passaic River Restoration Project Feasibility Study Work Plan*, which is currently undergoing revision in response to EPA and partner agency comments, will be considered to guide the NBSA FS.

Tierra Response
Section 1.3 text will be modified as shown below:

"This document is organized in accordance with the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA 1988) along with the additional guidance documents outlined in Section 1.1 and in accordance with the requirements for the FS provided in the AOC. During implementation of the NBSA FS, the final, agency-approved version of the *Feasibility Study Work Plan, Lower Passaic River Restoration Project* (Integral 2015) will be considered as an additional guide."

6) Section 1.4.1 "Unique Challenges of Sediment Sites"

Section 1.4.1 restates language presented in *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA 2005). Please combine this section with Section 1.4.3 and add site-specific information to each bullet item currently listed on page 1-3 to discuss how the listed challenges are applicable to Newark Bay and to expand on any challenges that are felt to be uniquely prevalent/significant to the FS.

Tierra Response

The text from Section 1.4.1 will be combined with Section 1.4.3 and will be Section 1.4.2 in the revised FS Work Plan. Site-specific information will be added to the bullet list as follows:

"1.4.2 Site-Specific Feasibility Study Considerations

In conducting the feasibility evaluation of potential remedial alternatives, it is important that site-specific factors that may present unique challenges to remediation are identified and appropriately considered. The *USEPA Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (USEPA 2005) specifically highlights why sediment sites may present unique challenges, as noted below, and encourages remediation managers to consider these and other site-specific characteristics in the remedy selection. The FS is based on site-specific data collected over time and will incorporate the CSM and the RI (including the risk assessments). Estimated and projected conditions developed through the Model have uncertainties that will be evaluated and incorporated to determine their appropriate use. The NBSA is a complex and dynamic estuary. An evaluation of data collected for the RI, combined with the use of appropriate site-specific models, consideration of changes in the geomorphology and human use over time, and geochemical evaluation of interactions between the NBSA and its tributaries, will be used to characterize the estuary to a level that is appropriate for FS decision making. In addition, the change in use of the Bay over time has had, and will, in the future, have significant impacts.

- Sediment sites may have a large number of sources, some of which can be ongoing and difficult to control. The constituents of potential concern (COPCs) in NBSA sediment will not be addressed by a simple, single-source, single-contaminant remediation that lends itself to a straightforward remedial selection and implementation. Historic industrial activity and on-going urban and industrial practices have impacted conditions in the NBSA. Numerous COPCs have been detected in sediments, including polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides, herbicides, volatile and semivolatile organic compounds (VOCs and SVOCs), metals, and polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans (PCDDs/PCDFs). This mix of COPCs, each with unique physicochemical characteristics, will need to be considered in the remedy evaluation and selection. The NBSA also has a multitude of natural and anthropogenic contributions to its water body that can affect the remedy selection, not only from a physical implementation perspective but due to ongoing contaminant source loading. Such contributions include:
    a. Combined sewer overflows (CSOs)
    b. Storm water outfalls (SWOs)
    c. Upstream and downstream sources (caused by tides) and tributaries
    d. A publicly owned treatment works (POTW) emergency relief point

e. Spills, leaks, and accidental discharges from marine and industrial discharger sources
f. Permitted industrial discharges

- The sediment environment of the NBSA is dynamic as a result of natural and anthropogenic forces including tidal action, storm surges, tributary flows, and ship traffic turbulence. The impact these forces may have on the implementation and/or operation and maintenance (O&M) phases of a remedy must be considered during the FS.

  The NBSA is a complex junction, hydrodynamically, resulting from three natural physical processes:

  - Astronomical forcing (including classical estuarine gravitational circulation) through the Kill van Kull and Arthur Kill tidal straits.
  - Freshwater tributary flows. The principal sources of freshwater are the Passaic and Hackensack Rivers. Minor contributors include the Peripheral Ditch and Piersons Creek (conduits for stormwater runoff), which empty directly into the Bay, as well as the Rahway and Elizabeth Rivers, Piles Creek, Morses Creek, and Fresh Kills Creek, which enter by way of the Arthur Kill tidal strait.
  - Local and regional meteorological events (Herrington et al. 2002; Wakeman III 2006).

  These primary influences combine to produce complex, event-driven circulation and make it challenging to identify a long-term average pattern (Chant 2006). Therefore, the primary physical processes should be monitored over the long-term to improve the understanding of sediment and contaminant dynamics in the NBSA. These processes include, but may not be limited to, meteorological events (wind, pressure), currents, tides, water properties (temperature and salinity), and suspended sediment load. In addition to natural forces, navigational dredging, including improvements/deepening and maintenance, occurs on a scale such that these activities have measurable and, at times, significant impacts on hydrodynamics.

  Due to the complexity of the system, it is important that calibrated/validated models of the hydrodynamics, sediment transport, and contaminant fate and transport, be used to inform decision-making during the FS by informing the assessment of impacts of storms, tides, wind-driven resuspension, and navigation, on any proposed remedy. The interpretation of model results, however, must take into account the uncertainty associated with each of the sub-models, as well as the propagated uncertainty in the final results.

  These complex hydrodynamic factors will need to be considered in the remedy evaluation.

- The physical construct of the NBSA is unique in that it is comprised of multiple geomorphic areas, as noted below, that may affect the implementation strategy of certain remedial actions and therefore should be considered during the FS.
  - Subtidal flats

- Historically disturbed subtidal flats
- Transitional slopes
- Navigation channels
- Port channels
- Intertidal areas
- Industrial waterfront areas

- The NBSA has major infrastructure and commercial activities that must be taken into account. Key factors (and potential constraints) for certain remedial actions, including shoreline conditions (e.g., integrity of riprap or bulkheads), bridges, port facilities, a confined disposal facility, and commercial shipping traffic, will require consideration and evaluation. As part of the NBSA RI, a comprehensive study documenting the constructed shoreline of Newark Bay was completed in 2013. This study showed that over 70% of the shoreline was hardened with either riprap or bulkhead. The integrity of these physical constraints will need to be considered during the FS as part of the evaluation of remedies that may impinge on these physical barriers.

- Cleanup work in an aquatic environment is frequently difficult from an engineering perspective and may be more costly than other media. In the NBSA, in particular, being a large, active commercial port, there are unique challenges that will impact logistics, coordination, and, as yet undefined port operations.

- Contamination is often diffuse and the sites are often large and diverse (e.g., mixed use, numerous property owners). Unlike many riverine sites, often in developed, commercial areas with constrained shorelines that limit the lateral extent of contamination, Newark Bay is a relatively wide body of water that includes both wide areas of subtidal flats and deep, man-made/maintained navigation channels, contributing to naturally complex dynamics that will complicate any remedy under consideration.

- Many sediment sites contain ecologically valuable resources or legislatively protected species or habitats. Newark Bay is considered by the National Marine Fisheries Service (2007) to be essential fish habitat (EFH) for various life stages of several species including Atlantic herring, various flounders/hake, Atlantic mackerel, bluefish, butterfish, scup, and black seabass. In addition, the Bay is inhabited seasonally by two federally listed threatened and endangered fish species—the Atlantic and shortnose sturgeon.

- For large sites, a number of communities with differing views and opinions may be affected. The NBSA is bounded by two states (New Jersey and New York), 4 counties (NJ: Union, Essex, Hudson; NY: Richmond (coextensive with Staten Island)), and multiple cities, towns and communities. There may be highly varying views on any remedy decisions, depending, in part, on proximity to each of these communities, thus impacting the feasibility assessment process."

7) Section 1.4.2 "Sediment Management Principles" – First paragraph

Section 1.4.2 references OSWER Directive 9285.6-08 and includes language from the Directive. Please expand Section 1.4.2 by including the following information that was also excerpted from the Directive (page 2, "Background", Third Paragraph), "While this directive applies to all contaminants at sediment sites addressed under CERCLA or RCRA, its implementation at particular sites should be tailored to the size and complexity of the site, to the magnitude of the site risk, and to the type of action contemplated."

Tierra Response
The first paragraph of the Section will be expanded to include the following sentence:

"While this directive applies to all contaminants at sediment sites addressed under CERCLA or RCRA, its implementation at the NBSA will be tailored based on the size and complexity of this site, to the magnitude of the site risk, and to the type of action contemplated."

8) Section 1.4.2 "Sediment Management Principles" – Principle No. 1

Consistent with OSWER Directive 9285.6-08 (page 2, "Control Sources Early"), please expand the text of Principle No. 1 to state that project managers will "assess which continuing sources can be controlled and by what mechanism." Based on information currently available from the RI data gathering, describe how sources of concern will be identified, assessed, and ranked in regard to their potential impact on FS decision making. Please provide examples of specific, potential sources of concern, based on available data and site background information.

Tierra Response
The following text will be added to Principle No. 1:

"Project managers will assess continuing sources that may be controlled and by what mechanism(s). That assessment will include information/data developed through the CSO/SWO assessment for the NBSA, starting in spring 2017. There are potentially three investigation phases anticipated in the CSO/SWO Work Plan (2017): acquisition and assessment of on-line and publicly available information, field verification, and CSO/SWO sampling. The draft work plan is based on an iterative approach with the conduct of each phase being dependent upon the result of its predecessor. Therefore, the only phase currently being executed, is the "Combined Sewer Overflow and Storm Water Outfall Characterization - Phase I: Reconnaissance Work Plan - Information Gathering." Other sources to be considered are permitted discharges, accidental releases, and inputs from tributaries. Each of these sources must be evaluated in terms of mass of contaminant input and risk to human health and the environment."

9) Section 1.4.2 "Sediment Management Principles" – Principle No. 4

Please add a reference to the guidance document "Technical Guidelines on Performing a Sediment Erosion and Deposition Assessment (SEDA) at Superfund Sites," ERDC TR-14-9 (USACE-ERDC, 2014). Please also expand the text to identify available datasets pertinent to assessing sediment stability (*e.g.*, NBSA SEDFlume testing data, Phase I/II sediment core radiodating and estimated deposition rates,

pending Phase I/II vs. Phase III surface sediment contaminant concentration comparison) and describe how these datasets may be used to address this principle in both the CSM update and the FS report.

Tierra Response

The SEDA guidance document will be added to the FS Work Plan Bibliography. The text in Principle No. 4 will be expanded to include the following text:

"The pending 2017 update to the CSM will contain an expanded section on hydrodynamics, sediment transport, and sediment stability, that will include assessment of the following data collected in the NBSA: currents, water properties, sediment physical properties (including deposition rates/stability), erosion rate as determined by SedFlume testing conducted by USEPA, and changing morphology of the system (i.e., through natural and anthropogenic forces). These data will be used to develop and refine the CSM by considering sediment stability to make risk management decisions and select potential remedial alternatives to protect human health and the environment."

10) Section 1.4.2 "Sediment Management Principles" – Principle No. 5

Please refer to Comment No. 1. Please revise the risk assessment text to broadly state that human health and ecological risk assessments will be conducted to characterize risks. Please also include reference to potential pilot testing activities and continued testing of hypotheses and re-evaluation of site assumptions as examples of iterative approaches. Please clarify the text to describe that additional iterations of the RI risk assessments are not anticipated during the FS.

Tierra Response

Responses to the PRA-related comments were discussed during a conference call between Tierra and USEPA on March 16, 2017; a decision from USEPA is pending. The RTCs will be amended once Tierra receives direction from USEPA.

The following text will be added:

"The *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites* document (USEPA 2002a) indicates "an iterative approach is defined broadly to include approaches which incorporate testing of hypotheses and conclusions and foster re-evaluation of site assumptions as new information is gathered. For example, an iterative approach might include pilot testing to define the effectiveness of various remediation technologies at a site."

11) Section 1.4.2 "Sediment Management Principles" – Principle No. 6

Consistent with OSWER Directive 9285.6-08 (page 6, "Carefully Evaluate the Assumptions and Uncertainties"), please expand the quote cited in Principle No. 6 to also include the text: "Management decisions must be made, even when information is imperfect. There are uncertainties associated with every decision that need to be weighed, evaluated, and communicated to affected parties. Imperfect knowledge must not become an excuse for not making a decision."

Tierra Response
The following text will be added to Principle No. 6:

"The guidance document *A Risk Management Strategy for PCB-Contaminated Sediments* (NRC 2001) provides a framework for application of the risk management approach for sediment sites:

a. The first stage in the framework is defining the problem and setting management goals. This problem-definition stage is defined as being the most important step in application of the risk-management framework and the effort for this step must be commensurate to the size and complexity of the NBSA, to the magnitude of the site risk, and to the type of action contemplated. The management goals may need to be modified as information is gathered about the NBSA risks and the best strategy for managing them.

b. The second stage in the risk management framework is analyzing the risks posed to human health and the environment through evaluation of the conceptual site model and completion of the risk assessments.

c. The third stage is examining management options and evaluating their effectiveness, feasibility, costs, benefits, unintended consequences, and habitat, cultural, and social impacts. The pros and cons of the range of options are considered and often a combination of technologies can be needed at a site.

d. The fourth stage in the framework is making a decision after the assumptions and uncertainties have been fully evaluated. During this stage of the framework, the project manager will review the information gathered during the analyses of risks and options to select the most appropriate risk management strategy. As outlined in the document, "The strategy selected should be one that actually reduces overall risk, not merely transfers risk to another site or another affected population. The decision-making process necessary to arrive at an optimal management strategy is complex and likely to involve numerous site-specific considerations. Management decisions must be made, even when information is imperfect. There are uncertainties associated with every decision that need to be weighed, evaluated, and communicated to affected parties. Imperfect knowledge must not become an excuse for not making a decision.""

12) Section 1.4.2 "Sediment Management Principles" – Principle No. 8

The text indicates that the FS will ensure that sediment cleanup levels are tied to the risk management goals. Please also state that RAOs need to meet the first two of the nine FS evaluation criteria (*i.e.*, protect human health and the environment and meet ARARs).

Tierra Response
The following sentence will be added to Principle No. 8:

"The RAOs for the site will be based on the nine FS evaluation criteria and will meet the objectives to protect human health and the environment and meet applicable or relevant and appropriate requirements (ARARs)."

13) Section 1.4.2 "Sediment Management Principles" – Principle No. 9

Tierra Response
EPA has withdrawn comment 13 via email from Eugenia Naranjo to Clifford Firstenberg on March 1, 2017.

14) Section 1.4.2 "Sediment Management Principles" – Principle No. 10

Please clarify why the last sentence states "…value engineering may be incorporated in the FS." Under what circumstances would value engineering not be considered?

Tierra Response
The word "may" will be replaced with the word "will" in the sentence to now state, "The principles and systematic approach of value engineering will be incorporated in the FS."

15) Section 1.4.2 "Sediment Management Principles" – Principle No. 11

a. In the first sentence, please change the phrase "and/or" to simply "and", as it is anticipated that biological monitoring will be part of remedy effectiveness monitoring.

   Tierra Response
   The first sentence will be modified as indicated.

b. Please revise end of first sentence to read "…and to evaluate if the RAOs and site-specific remediation goals are being met," since monitoring is to be performed to determine if both RAO (broad objectives) and site-specific remediation goals for sediment, water, and biota are met.

   Tierra Response
   The first sentence will be modified to include the underlined text.

16) Section 1.4.3 "Site-Specific Feasibility Study Consideration"– First paragraph

a) Please clarify the sentence "Estimated and projected conditions have uncertainties..." The meaning of "estimated and projected conditions" is not clear. How will uncertainties be evaluated and to what does "appropriate use" refer?

   Tierra Response
   The sentence will be revised as follows to clarify the intent:

   "Estimated and projected conditions developed through the Model have uncertainties that will be quantified to make risk management decisions."

b) The text states that "The NBSA is a complex and dynamic estuary that cannot be understood by simply evaluating the data collected within the NBSA …" Please identify which data from outside the NBSA are needed to complete the FS.

Tierra Response
The text will be modified as follows:

"The NBSA is a complex and dynamic estuary ~~that cannot be understood by simply evaluating the data collected within the NBSA~~."

c) Please also clarify the meaning of the phrase "unique challenges of the NBSA affecting the estuary".

Tierra Response
The phrase will be removed.

d) Revise the text to replace negative statements with a description of a likely problem-solving approach. For example, replace the statement "The NBSA…cannot be understood by simply evaluating the data…" with a statement such as "An evaluation of data collected for the RI combined with the use of appropriate site-specific models, consideration of changes in the geomorphology and human use of the NBSA over time, and geochemical evaluation of interactions between the NBSA and its tributaries will be used to characterize the estuary to a level that is appropriate for FS decision making."

Tierra Response
The example text will replace the original text in the FS Work Plan.

17) Section 1.4.3 "Site-Specific Feasibility Study Consideration"– Second paragraph and first bullet

Please state how discharges of potential concern from CSOs, SWOs, wastewater treatment plants, and marine/industrial spills and releases will be identified and characterized to calculate and appropriately weight contaminant loadings to Newark Bay (contaminant mass balance).

Tierra Response
The following text will be added after the last sub-bullet ("Industrial discharges"):

"Loading from CSOs, SWOs, and wastewater treatment plants will be identified and characterized using information obtained from the planned CSO/SWO characterization program (Tierra 2017). Marine/industrial spills and releases will be investigated via public records. Information obtained from these efforts will be used, to the extent possible (e.g., while a release might be identified, it may not be possible to obtain a reasonable estimate of the mass of contaminant released), to develop an estimate of mass loadings of contaminants to Newark Bay that have the potential to impact potential remedies."

18) Section 1.4.3 "Site-Specific Feasibility Study Consideration"– Second bullet

Please clarify how "anthropogenic forces" from CSO and SWO discharge points could impact the operation and maintenance of a remedy. Is this intended to be distinct from the first bullet (contaminant sources)? Discuss how the hydrodynamic and sediment transport model and other

supporting models can be implemented to assess impacts of storms, tides, wave-driven resuspension, and navigation on the NBSA sediment bed.

Tierra Response
The following, underlined text, will be added to the second bullet:

"The sediment environment of the NBSA is dynamic as a result of natural and anthropogenic forces, acting on a variety of spatial scales, including tidal action, storm surges, tributary flows, CSO and SWO discharges, ship traffic turbulence, and navigation channel dredging."

In addition, the following text will be added to the FS Work Plan:

"Therefore, the primary physical processes should be monitored over the long-term to improve the understanding of sediment dynamics in the NBSA. These processes include, but may not be limited to, meteorological events (wind, pressure), currents, tides, water properties (temperature and salinity), and suspended sediment load.

In addition, navigational dredging (improvements/deepening and maintenance) occurs on a scale such that these anthropogenic activities have measurable and, at times, significant impacts on hydrodynamics. And physical impacts from CSO and SWO discharges (i.e., local scour) need to be considered if a remedy is in close proximity.

It is important that calibrated/validated models of the hydrodynamics, sediment transport, and contaminant fate and transport, be used to inform decision-making during the FS by informing the assessment of impacts of storms, tides, wind-driven resuspension, and navigation, on any proposed remedy. The interpretation of model results, however, must take into account the uncertainty associated with each of the sub-models, as well as the propagated uncertainty in the final results."

19) Section 1.4.3 "Site-Specific Feasibility Study Consideration"– Third bullet

The observation that contaminated sediment remediation poses unique challenges in comparison to upland site remediation is redundant here and can be removed from the text.

Tierra Response
The referenced text will be deleted.

20) Section 1.4.3 "Site-Specific Feasibility Study Consideration" – Bullet List

Please add the following new bullet: "The presence of contaminant patterns, as revealed through the RI sediment chemical characterization programs. Some regions and geomorphic areas of the bay are more heavily impacted by certain contaminants than other regions and geomorphic areas, based on proximity to sources."

Tierra Response
The bullet will be added to the FS Work Plan.

21) Section 1.4.3 "Site-Specific Feasibility Study Consideration" – Bullet List

Please add the following new bullet: "Key factors (and potential constraints) for certain remedial actions, including shoreline conditions (e.g., integrity of riprap or bulkheads), bridges, port facilities, and commercial shipping traffic, will require consideration and evaluation." Please state whether these topics are to be evaluated during the FS or as part of pre-design investigations.

Tierra Response
The text will be modified as follows:

- "The NBSA has major infrastructure and commercial activities that must be taken into account. Key factors (and potential constraints) for certain remedial actions, including shoreline conditions (e.g., integrity of riprap or bulkheads), bridges, port facilities, a confined disposal facility, and commercial shipping traffic, will require consideration and evaluation. As part of the NBSA RI, a comprehensive study documenting the constructed shoreline of Newark Bay was completed in 2013. This study showed that over 70% of the shoreline was hardened with either riprap or bulkhead. The integrity of these physical constraints will need to be considered during the FS as part of the evaluation of remedies that may impinge on these physical barriers."

22) Section 2 "Study Area Setting" – First paragraph

Please revise the text that follows "…CSM (Tierra 2013), which is an evolving document that will be updated in the near future …" to read "… CSM (Tierra 2013), which is an evolving document that will be updated in spring 2017…" to be consistent with page 1-4. Please also clarify that the CSM update is a RI task and not a FS task.

Tierra Response
The text will be modified as follows:

"This section of the FS WP provides a general overview of the physical setting and site history from the most current version of the CSM (Tierra 2013), which is an evolving document that will be updated in spring 2017 and used as the basis for the FS. The CSM will be updated as needed, predominately, during the RI, but could be updated after the RI if additional data are collected."

23) Section 2.2 "History & Physical Setting" – General Comment

To complete Section 2.2 "History and Physical Setting," please add a paragraph on the Diamond Alkali Superfund Site, discuss its connection to Newark Bay (Operable Unit 4), add a reference to the RI effort, and include a reference to Figure 1-1.

Tierra Response
The following text will be added:

"The Diamond Alkali Superfund site is a multi-party, multi-contaminant site that includes the former manufacturing facility at 80-120 Lister Avenue in Newark, New Jersey (Operable Unit 1), the Lower 8.3 miles of the Passaic River Study Area (Operable Unit 2), the 17-mile Lower Passaic River Study Area (Operable Unit 3) and the Newark Bay Study Area (Operable Unit 4). The locations of the Operable Units are shown on Figure 1-1. The RI for the NBSA is currently on-going and is estimated to be completed in 2020."

24) Section 2.2 "History & Physical Setting" – First paragraph

Please add CSM figures to the FS Work Plan or remove the sentence "Summary figures from the CSM are included for reference."

Tierra Response
The text will be modified as follows:

"Summary figures from the 2013 CSM are included for reference: an historical timeline of some major construction and storm activities inside and neighboring the NBSA is presented on Figure 2-1, and the locations of the historical features as well as estimates of the historical shoreline within the NBSA are presented on Figure 2-2."

25) Section 3.0 "Identification of Data Uses and Needs" – General comment

Please clarify that once the risk assessment has been completed, the FS text will identify the COPCs that exceed the risk range and the goal of protection of a HI = 1 for specific health effects.

Tierra Response
The following text will be added to Section 3.0:

"The Feasibility Study will include a summary of chemicals from the human health risk assessment that have a hazard index greater than 1 or risk outside of the acceptable risk range."

26) Section 3.0 "Identification of Data Uses and Needs" – Pages 3-1 to 3-2

a) Page 3-1 states "The SOW includes the completion of the BHHRA, BERA, and PRA." As stated, this is not a FS data need. Please revise to generically identify unacceptable human and ecological health risks, exposure pathways, and preliminary remediation goals (PRGs) as risk assessment output needed for the FS. Also, a Probabilistic Risk Assessment is not described in the AOC. Please correct the sentence.

   Tierra Response
   As outlined in Section 4.1, Description of Remedial Action Objectives and Preliminary Risk-Based Remediation Goals, PRGs will be developed through completion of the human health and ecological risk assessments.

Responses to the PRA-related comments were discussed during a conference call between Tierra and USEPA on March 16, 2017; a decision from USEPA is pending. The RTCs will be amended once Tierra receives direction from USEPA.

b) Page 3-1 states that "The results from the Phase III Sediment Investigation will be used…to *update* the risk assessments and RI of the NBSA" (italics added). The word choice suggests that there will be an iterative process of risk assessment that is not desirable – the development of supplemental risk assessments may be confusing and multiple updates to RAGS Part D tables will be time-consuming to review and would impact the project schedule. Please clarify or revise the wording from "update" to "complete"; see also Comment No. 1.

Tierra Response
The sentence will be modified as follows:

"The results from the Phase III Sediment Investigation will be used along with the results from samples collected during Phase I and Phase II, and Secondary Data for Newark Bay, to conduct the risk assessments and RI of the NBSA."

c) Page 3-2, first to last bullet (PRA). How will the most sensitive receptors be identified and what additional data will be required to "decrease uncertainty" regarding their calculated exposures and associated risk? As discussed in Comment No. 1, please remove reference to the PRA.

Tierra Response
Responses to the PRA-related comments were discussed during a conference call between Tierra and USEPA on March 16, 2017; a decision from USEPA is pending. The RTCs will be amended once Tierra receives direction from USEPA.

27) Section 4.0 "Technical Approach" and Figure 4-1

a. While the FS Technical Approach and Figure 4-1 "Flow Chart" present a textbook timeline of when tasks will occur, please consider what tasks can occur in parallel (versus sequentially). For example, on the Berry's Creek Study Area project, the Treatability Study & Pilot Study task was conducted in parallel with the Remedial Investigation to provide more upfront information for the Initial Screening of Alternatives. Please add language to the FS Work Plan that Tierra will consider (where appropriate) conducting tasks in parallel to enhance the overall FS program.

Tierra Response
The following sentence will be added to the introductory text in Section 4:

"Tasks associated with the FS may be conducted in parallel to enhance the overall FS program."

b. Please add an inset to Figure 4-1 with acronym definitions.

Tierra Response
The list of acronym definitions will be added to Figure 4-1.

28) Section 4.1 "Task 1" – General comment

a. Please note that 'To Be Considered' criteria (TBCs) will be examined along with ARARs.

Tierra Response
The following sentence will be added to Section 4.1:

"To Be Considered (TCB) criteria will also be examined along with ARARs."

b. Please clarify that PRGs are to be developed during the risk assessment and that essentially a transfer of information from the risk assessments is envisioned here, otherwise please clarify what type of PRG development will occur as part of Task 1.

Tierra Response
The bullet associated with PRGs will be modified as follows:

"PRGs are risk-based concentrations of individual COPCs in environmental media and will be developed through completion of the human health and ecological risk assessments."

c. The text states that "PRGs will also consider any ARARs." Please revise sentence to read "PRGs will be protective of human health and the environment, and they will meet ARARs."

Tierra Response
The bullet associated with PRGs will be modified as follows:

"PRGs will be protective of human health and the environment, and they will meet ARARs (or provide grounds for invoking a waiver)."

29) Section 4.2 "Task 2" – Second bullet on top of page

When discussing potential exposure pathways, please add a reference to the human health and ecological risk assessments, where the pathways of exposure will be identified.

Tierra Response
The bullet will be modified as follows:

"Preparation of a site-specific statement of purpose for the response, identifying the actual or potential exposure pathways identified in the human health and ecological risk assessments that will be addressed by remedial alternatives."

30) Section 4.3 "Task 3" – "Work Effort"

a. Please include Institutional Controls, Sediment Removal, and Containment with In-situ Treatment (e.g., an amended cap) as possible alternatives to be examined for NBSA.

Tierra Response
The following bullets will be added to the list:

- An alternative that involves containment of waste with in situ treatment (e.g., an amended cap);
- Alternatives including Institutional Controls;
- Sediment removal;

b. Please clarify the criteria that will be used to determine which technologies have a significant potential for being implemented in Newark Bay (versus being ruled out). Further, the text needs to indicate the basis for selecting "promising innovative technologies".

Tierra Response
The following text will be modified as indicated:

"The list of alternatives will be limited to only those that are relevant and have significant potential for being implemented at the NBSA based on their ability to meet the threshold criteria of being protective of human health and the environment and meeting ARARs (or provide grounds for invoking a waiver)."

The following text will be added:

"As outlined in the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA 1988), "Innovative technologies would normally be carried through the screening phase if there were reason to believe that the innovative technology would offer significant advantages. These advantages may be in the form of better treatment performance or implementability, fewer adverse impacts than other available approaches, or lower costs for similar levels of performance.""

31) Section 4.4 "Task 4" – Bullet on Effectiveness, Implementability, and Costs

a. The text describing Effectiveness, Implementability, and Costs is taken from the USEPA 1988 RI/FS guidance document. It is recommended that this section be revised to more closely follow "The Feasibility Study: Detailed Analysis of Remedial Action Alternatives" (USEPA 1990) and "Contaminated Sediment Remediation Guidance for Hazardous Waste Sites" (USEPA 2005).

Tierra Response
The text describing Effectiveness, Implementability and Costs will be modified as follows:

- "*Effectiveness* – this evaluation will focus on the potential effectiveness of the alternatives in handling the estimated areas or volumes of media and meeting the remediation goals identified in the RAOs and the PRGs (based on the ARARs), potential impacts to human health and the environment, and how proven and reliable the process is with respect to the contaminants and conditions at the Site. The alternatives will be evaluated as to its effectiveness in providing protection and the reductions in toxicity, mobility or volume that it will achieve. Both the short- and long-term components of effectiveness will be evaluated when comparing the alternatives. The reduction of toxicity, mobility, or volume refers to the changes in one or more characteristics of the hazardous substances or contaminated media by the use of treatment that decreases the inherent threats or risks associated with the hazardous material.
- *Implementability* – this evaluation encompasses both the technical and administrative feasibility of implementing a technology process. The technical implementability will be used as the initial screen of technology types and alternatives to eliminate those that are clearly ineffective or unworkable at the Site. The more detailed administrative evaluation of alternatives places greater emphasis on the institutional aspects of implementability, such as the ability to obtain necessary permits for off-site actions, the availability of treatment, storage and disposal services (including capacity), and the availability of necessary equipment and skilled workers to implement the technology.
- *Cost* – this evaluation is made on the basis of engineering judgment where each alternative is categorized as to whether costs are high, medium, or low relative to other alternatives in the same technology type."

b. The bullet for Effectiveness should be re-written to include the words "This evaluation will focus on the potential effectiveness of the alternatives in meeting ARARs, RAOs, and site-specific remediation goals as established through the project risk assessments." As currently written, the text primarily addresses potential impacts during construction (short-term effectiveness).

Tierra Response
See previous response to Comment 31a.

32) Section 4.5 "Task 5" – First paragraph

Please describe some of the criteria that would be used to determine the need for a Treatability Study, Bench-scale Study, and/or Pilot Study.

Tierra Response
The following text will be added to the FS Work Plan:

"The following are criteria that may be used to determine the need for a treatability study, bench-scale study and/or pilot study:

- A candidate technology has shown promise in the scientific/engineering community (e.g., in situ bioremediation) but limited data exists to evaluate effectiveness, implementability, and/or cost.

- A candidate technology is only conceptual but a stakeholder(s) is promoting its evaluation.
- Site-specific data are necessary for a promising candidate technology to better evaluate effectiveness, implementability, and/or cost.
- An iterative (adaptive management) approach is desired, e.g., conducting a thin-layer capping pilot study in a representative area of the site.
- Prior studies for a promising candidate technology were inadequately designed and/or implemented.
- The body of knowledge has advanced in recent years for a promising candidate technology whose prior study(s) was unsuccessful/inconclusive."

33) Section 4.5 "Task 5" – Second bullet under Treatability Testing Work Plan

a. Please revise second sub-bullet to read: "Remedial technology(ies) to be tested and the rationale for their selection."

Tierra Response
The text will be revised as directed.

b. For the ninth sub-bullet, please clarify whether the Health and Safety Procedures cited are for the workers or the community (or both).

Tierra Response
The text will be revised as follows:

- "Health and safety plan that includes procedures to protect workers and, if needed, the community; and "

34) Section 4.6 "Task 6" – "Subtask 1" and page 4-7, Third bullet "Modifying Criteria"

a. The detailed analysis of alternatives will evaluate the first seven of the nine criteria. The last two criteria ("state acceptance" and "community acceptance") are evaluated after the Proposed Plan phase. Please add information to this effect to Task 6.

Tierra Response
The text will be revised as follows:

"Subtask 1: The alternatives will be analyzed using the first seven of the nine evaluation criteria outlined in the CERCLA guidance and the NCP."

b. Based on USEPA 1988 guidance, "Modifying Criteria" (State Acceptance and Community Acceptance) are to be addressed in the ROD based on comments on the RI/FS and Proposed Plan. Please correct the text.

Tierra Response
The text will be revised as follows:

- "Modifying criteria (criteria 8 and 9) - State and community acceptance are modifying criteria that will be addressed in the Record of Decision once comments on the RI/FS Report and Proposed Plan have been received."

35) Section 4.7 "Task 7"

Please add a task for Final Feasibility Study Report (or add the final version to Task 7).

Tierra Response
The text will be revised as follows:

"The draft FS Report will be submitted to USEPA for review and comment, and subsequently revised per USEPA's comments, and resubmitted for review and approval of the final FS Report."

36) Figure 1-1

Please clearly label the Diamond Alkali Superfund Site OU-1 at 80-120 Lister Avenue

Tierra Response
Figure 1-1 will be revised to clearly label the Diamond Alkali Superfund Site OU-1.

37) Figure 2-1

a. Please add the Newark Bay Confined Disposal Facility (CDF) and Conrail Bridge to the timeline, so that all features displayed on Figure 2-2 are presented on the timeline.

   Tierra Response
   The Newark Bay Confined Disposal Facility (CDF) and Conrail Bridge will be added to Figure 2-1 so all features displayed on Figure 2-2 are presented on the timeline on Figure 2-1.

b. Please explain the difference between the 2011 Tropical Storm Lee and the "2011 Local Storm" presented on the timeline.

   Tierra Response
   Tropical Storm Lee hit the Gulf coast, traveling inland through the Carolinas. As it traveled, it weakened so it wasn't categorized as a "tropical storm" by the time it reached the NBSA. So, this storm was identified as being a "local storm."

c. Please clarify how instances of a Passaic major flood event can occur without an associated storm. (For example, major floods were recorded in 1987 and 1989, but there is no local storm,

tropical storm, or hurricane on record.) Please investigate the primary source where floods were recorded to see if a local storm occurred within the time of the recorded flood event.

Tierra Response
The referenced document used to identify major flood events does not describe the cause of these events and no information is readily available. Providing an explanation would be speculative, however possible causes could include extended periods of rain combined, or not, with high winds and/or strong tides.

38) Figure 2-2

a. Please provide information (if possible) on what tidal condition the three shorelines represent.

Tierra Response
Tidal information is not available for the three shorelines shown on Figure 2-2. The 1845 and 1940 source charts do not provide a datum reference for the soundings, therefore the tide stage is unknown. The July 2002 aerial photo does not provide time of day, therefore the tide stage is unknown.

b. Please provide the reference for the 1845 and 1940 shorelines.

Tierra Response
As described in Note #7 on Figure 2-2, the historical shorelines (i.e., 1845 and 1940) were digitized from NOAA charts downloaded from http://historicalcharts.noaa.gov/historicals/search.

c. Please clarify if the symbol for "Historical Structure" (dotted orange line) represents above-ground or underground structures.

Tierra Response
The symbol for "Historical Structure" (dotted orange line) represents above-ground structures (i.e., former bridges). The legend of Figure 2-2 will be updated as follows:

"HISTORICAL STRUCTURES (ABOVE GROUND)"

d. Please add an arrow pointing to the position of the "Howland Hook Marine Terminal.

Tierra Response
An arrow will be added pointing to the position of the "Howland Hook Marine Terminal."